I am please to report that my scanning extravaganza is complete and images of all installments of Puzzle Corner (starting January, 1966) are available on the web site (cs.nyu.edu/~gottlieb/tr).

Since this is the first issue of a new academic year, let me once again review the ground rules. In each issue I present three regular problems, the first of which is normally related to bridge, chess, or some other game, and one "speed" problem. Readers are invited to submit solutions to the regular problems, and two columns (i.e., four months) later, one submitted solution is printed for each regular problem; I also list other readers who responded. For example, the current issue contains solutions to the regular problems posed in May/June.

The solutions to the problems in this issue will appear in the January/February column, which I will need to submit in mid October. Please try to send your solutions early to ensure that they arrive before my deadline. Late solutions, as well as comments on published solutions, are acknowledged in subsequent issues in the "Other Responders" section. Major corrections or additions to published solutions are sometimes printed in the "Better Late Than Never" section, as are solutions to previously unsolved problems.

For speed problems the procedure is quite different. Often whimsical, these problems should not be taken too seriously. If the proposer submits a solution with the problem, that solution appears at the end of the same column in which the problem is published. For example, the solution to this issue's speed problem is given on the facing page. Only rarely are comments on speed problems published.

There is also an annual problem, published in the first issue of each year, and sometimes I go back

into history to republish problems that have remained unsolved.

Problems

S/O 1. Larry Kells apparently plays Bridge against some fairly poor opponents. He asks, what is the weakest combined holding that North-South can have and still be able to make 7 Spaces against **worst** play by the defense. What about 7NT?

S/O 2. Scott Silverstein is a fan of a Tommy Tutone song involving a woman named Jenny whose phone number is 867-5309. Silverstein noticed that his own 7-digit number includes exactly four of Jenny's digits (in the same position as in her number). What is the probability that a random 7-digit number has this property?

S/O 3. Ermanno Signorelli heard on a PBS broadcast that it would take 17 copies of the planet Mercury is encircle the Earth at its equator. Assuming both planets are spheres and the 17 Mercurys fit exactly, how many Mercurys can be placed under the equator inside a hollow sphere the size of the Earth

Speed Department

Sorab Vatcha wants you to find a 9-letter English word that becomes an 8-letter English word by removing one letter and *not* rearranging the remaining letters. Then remove another letter without rearranging to get a 7-letter word, then 6, down to a single letter English word. Now find three other 9-letter words with this same property.

Solutions

M/J 1. Apo Sezginer is fond of Sudoku and is interested in certain transformations (defined below) of the 9x9 grid. Any sudoku solution is mapped to other solutions by these transformations. The question is whether there are two solutions such that none of the transformations maps the first to the second.

To define the transformations recall that the 9x9 grid A is normally indexed via

$$A[p, q];\ p = 1, 2, \ldots, 9;\ q = 1, 2, \ldots, 9$$

Instead we wish to use four indices each ranging from 1 to 3. Specifically we define the four-index representation in terms of the standard two-index form via

$$A[M, N, m, n] = A[(M-1) \times 3 + m, (N-1) \times 3 + n];$$

The most straightforward solution comes from John Chandler who writes. Here are two sudoku solutions that are the same for the first six rows and the first column. None of the transformations can convert one into the other. I haven't constructed a proof that no combination of two or more transformations can do the job, but the problem as stated allows only one transformation.

1	4	3	6	2	8	9	5	7
2	9	5	7	3	1	8	4	6
6	7	8	4	9	5	2	1	3
5	2	7	8	4	3	1	6	9
3	1	4	5	6	9	7	8	2
8	6	9	1	7	2	4	3	5
4	3	1	2	5	7	6	9	8
9	8	2	3	1	6	5	7	4
7	5	6	9	8	4	3	2	1

1	4	3	6	2	8	9	5	7
2	9	5	7	3	1	8	4	6
6	7	8	4	9	5	2	1	3
5	2	7	8	4	3	1	6	9
3	1	4	5	6	9	7	8	2
8	6	9	1	7	2	4	3	5
4	3	1	9	5	7	6	2	8
9	5	6	2	8	4	3	7	1
7	8	2	3	1	6	5	9	4

Dan Loeb and Phillip Nimmo have sent more elaborate solutions that now appear on the puzzle corner web site.

M/J 2. The late Bob High sent us a number of problems, including many cryptarithmetic examples in which one substitutes a digit for each letter so that the result is a true arithmetic statement. This month's offering features "a bit of Spanish".

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POCO
POCO
POCO
POCO
POCO
POCO
POCO
POCO
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 POCO
 POCO
 POCO
 POCO
 POCO
 POCO
 POCO
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MUCHO
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Frank Davis sent us the following solution.

POCO = 4595 and MUCHO = 68925.

We need to add 15 POCO's that sum to MUCHO. All sums of 15 identical digits (in each column) must end in 5 or 0. 1x15=15, 2x15=30.....9x15=135. Thus, the sum of each column without the carry from the column to its right ends in 0 or 5. The right hand column has no carry; so, the O in MUCHO is 0 or 5.

It cannot be 0, since the sum of the units column is then 0, and there is no carry to the tens column. With no carry, that column of C's has to carry the value of C into the hundreds column to add to the sum of 15 O's (Zero) to put a C in MUCHO. Only C=1 can do that; so, H=5 & C=1. Now, however, there is no carry to add to the column of 15 P's making U of MUCHO either 0 or 5; but, H=5 and O=0 already. Impossible!

Then, O can only be 5 and the carry to the tens column is 7. All values of C from 0 to 8 create conflicts by duplicating assigned letter values or C has to have two different values. However, C=9 makes the tens column sum 142 (135 + 7 carry). H=2 and 14 is the carry. The O's sum to 75 and 14 carry added is 89. So, C is 9 and 8 is the carry to add to sum of 15 P's. Only P=4 does not create duplications or conflicts. Hence U=8 and M=6. Because O must equal 5 and C must equal 9 and P must equal 4, I believe the solution is unique. I like these alphabetical number problems; but, cannot recall seeing this one before.

Although I, and I believe High, intended the problem to be solved in base 10, Joel Sokel checked all bases up to 50 with the following results.

Base-8: 1 solution (P=2, O=0, C=1, M=3, U=6, H=7)
Base-9: 1 (P=5, O=0, C=1, M=8, U=3, H=6)

Base-10: 1 (as above)	Base-35: 145
Base-11: 6	Base-36: 55
Base-12: 3	Base-38: 33
Base-13: 23	Base-40: 58
Base-21: 56	Base-42: 396
Base-28: 221	Base-44: 38
Base-30: 12	Base-46: 78
Base-32: 50	Base-48: 77
Base-34: 28	Base-49: 236

M/J 3. Fred Davidson recalls the familiar "birthday paradox", where we calculate that if 23 people are chosen at random, then there is about a 50% chance that at least two have the same birthday (ignoring leap-years, and assuming all birthdays are equally likely).

Davidson, however, has chosen 365 people at random and wants to know how many distinct birthdays would occur on average (same assumptions as above).

I received a number of interesting solutions. The most straightforward is from Scott Nason, who writes

The probability that any individual will not have a specified birthday is 364/36. With 365 people, the probability that none of them has a birthday on January 1 (or any other day, as per the problem assumptions) is 364/365 to the 365th power or approximately 36.74%. Conversely, the odds that at least one person will have that birthday is 63.26%. Since that is the probability for every day, the average number of days that will have at least one person with that birthday is .6326 * 365 or 231.

Since the computation involves only the four basic operations applied to integers, the exact solution is a rational number, i.e., a quotient of integers. Our web site gives Leo Stein's rational calculation. The resulting numerator and denominator are each about 1000 digits. I did not check if the result is in lowest terms :-).

Also on the site is an entertaining solution from Richard Morgan, which he claims is based on a real event. However, it involves a golf story so the veracity is naturally in doubt.

Better Late Than Never

J/F 1. Paul Horvitz and Steve Kanter believe that the published solution does not follow the "law of total tricks" since declarer must play in the partnership's longest suit. Kanter's solution, which does follow these rules, is on the web site.

J/F SD. Steve Sperry felt the speed problem was obscure and Lila Feingold felt the analogy doesn't work since Thomas is not an honorific or title, but simply a first name. Captain was not Kidd's first name, which was William. Her summary is "sloppy, sloppy".

Other Responders

Responses have also been received from D. Aucamp, M. Branicky, D. Diamond, T. Gooch, G. Grossman, J. Han, J. Harmsi, A. Hirshberg, E. Nelson-Melby, B. Norris, J. Norvik, A. Ornstein, M. Perkins, K. Rosato, P. Schottler, I. Shalom, S. Sperry, and C. Swift.

Proposer's Solution to Speed Problem

Sparkling, sparking, sparing, spring, sprig, prig, pig, pi, I. Splatters, splatter, platter, latter, later, late, ate, at, a. Splitters, splitter, slitter, litter, liter, lite, lit, it, I. Startling, starting, staring, string, sting, sing, sin, in, I.

Send problems, solutions, and comments to Allan Gottlieb, New York University, 715 Broadway, Room 712, New York, NY 10003, or to gottlieb@nyu.edu. For other solutions and back issues, visit the Puzzle Corner website at cs.nyu.edu/~gottlieb/tr.